Printed Page:- 03 **Subject Code:- BMICA0104**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MCA

SEM: I - THEORY EXAMINATION (2023-2024)

Subject: Problem Solving and Algorithmic Thinking

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. Which type of loop is guaranteed to have the body execute at least once? (CO1) 1

(a) do-while loop
(b) switch
(c) for loop
(d) while

1-b. Which type of loop is best known for using an index or counter? (CO1) 1

(a) do-while loop
(b) switch
(c) for loop
(d) while

1-c. Breaking a complex problem down into smaller problems and solving each one individually is known as : (CO2) 1

(a) Decomposition
(b) Abstraction
(c) Programming
(d) Algorithmic Thinking

1-d. The advantages of arrays are : (CO2) 1

(a) Objects of mixed data types can be stored
(b) Elements in an array cannot be sorted

(c) Index of first element of an array is 1

(d) Easier to store elements of same data type

1-e. Choose from the following areas where NLP can be useful. (CO3) 1

(a) Automatic Text Summarization

(b) Automatic Question-Answering Systems

(c) Information Retrieval

(d) All of the mentioned

1-f. What will be the best case time complexity of merge sort? (CO3) 1

(a) O(n log n)

(b) O(n2)

(c) O(n2 log n)

(d) O(n log n2)

1-g. If for an algorithm time complexity is given by O(1) then complexity of it is: (CO4) 1

(a) Constant

(b) Polynomial

(c) Exponential

(d) none of the mentioned

1-h. Asymptotic analysis is _____ bound. (CO4) 1

(a) Output

(b) Input

(c) Outer

(d) Inner

1-i. What does Polymorphism in OOPs mean? (CO5) 1

(a) Concept of allowing overriding of function

(b) Concept of hiding data

(c) Concept of keeping things in different modules

(d) Concept of wrapping things into a single unit

1-j. While using encapsulation, which among the following is possible? (CO5) 1

(a) Code modification can be additional overhead

(b) Data member’s data type can be changed without changing any other code

(c) Data member’s type can’t be changed, or whole code have to be changed

(d) Member functions can be used to change the data type of data members

2. Attempt all parts:-

2.a. Can an if-else statement have multiple conditions using "else if" clauses? Explain. (CO1) 2

2.b. What are the steps in the algorithmic problem-solving process? (CO2) 2

2.c. Explain Linear (Sequential) Search and when we use linear search? (CO3) 2

2.d.	Explain Asymptotic notations in algorithm analysis. (CO4)	2
2.e.	Explain Abstraction with real time example. (CO5)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	What challenges have you faced during data collection and how did you overcome them? (CO1)	6
3-b.	Define types of loops with suitable example. (CO1)	6
3-c.	Compute the truth values of a formula P v Q -->(~Q --> ~P) for all possible truth values of atoms using truth table. (CO2)	6
3-d.	What are decomposition and abstraction in computational thinking? (CO2)	6
3.e.	What is the relationship between searching and sorting? Explain any one searching algorithm. (CO3)	6
3.f.	Differentiate between Big oh and omega notation with example. (CO4)	6
3.g.	Explain the key characteristics of object-oriented programming (OOP). (CO5)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	How do you use nested loops in programming? Explain with example. (CO1)	10
4-b.	What are the different types of conditional statements used in programming languages? (CO1)	10

5. Answer any one of the following:-

5-a.	How is computational thinking used in programming? What are the four types of computational thinking? (CO2)	10
5-b.	What are the four types of problem solving? What are benefits of problem solving skills. (CO2)	10

6. Answer any one of the following:-

6-a.	Explain Insertion Sort algorithm with an suitable example. (CO3)	10
6-b.	Apply binary search and find the average number of comparisons required to find an element 11,15,17,19,21,25,27,29,31 (CO3)	10

7. Answer any one of the following:-

7-a.	Can we say that the time for Merge Sort is $\Theta(n \log n)$. What is its worst and best time of procedure for Merge Sort. (CO4)	10
7-b.	Derive the worst case complexity of the Selection sort algorithm. (CO4)	10

8. Answer any one of the following:-

8-a.	What are the advantage of OOPs over Procedure-oriented programming language? (CO5)	10
8-b.	What are the main features of procedural programming? What are the problems in procedural programming? (CO5)	10